



# BODY MOVEMENT AND HEART BEAT MONITORING OF COMA PATIENTS USING IOT

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## **ABSTRACT:**

Coma patients require continuous monitoring of their body movements and heart rate to ensure timely intervention and appropriate medical care. In this study, we propose a novel approach that leverages the Internet of Things (IoT) technology to monitor and track the body movement and heart rate of coma patients in real time. Furthermore, the proposed system offers several advantages over traditional monitoring methods. It provides real-time monitoring, allowing for immediate response in critical situations. The non-intrusive nature of the wearable devices ensures patient comfort and reduces the risk of complications. The system can also be remotely accessed by healthcare professionals, enabling them to monitor multiple patients simultaneously and make informed decisions based on real-time data.

**Keywords:** *Heart beat, IOT, Flex sensor, SMS, Eye blink detection.*

## **1. INTRODUCTION**

Patient movement & monitoring system is a system that is used to detect movement changes in the patient. Those changes may be either abnormal behaviors or unusual changes made by the patient in the absence of a doctor. This introduced system presents the method of coma Patient Movement Monitoring for those taking medical treatment in both local and foreign hospitals with the help of frames comparison approach. Detection of changes due to movement in a real-time video is a very important tool. This project deals with the development of body monitoring and heart rate monitoring systems for coma patients who can monitor the movement using eye blink detection, leg movement using flex sensor as well as finger movement using flex sensor. The system also implemented sleep fall detection using accelerometer and heart rate monitoring system. Android application is developed which uses IOT protocols to communicate with the hardware to fetch the patient data and display it to the family members of the patient. This system immediately detects the body movement of coma patient and send alert, which ensures immediate attention of the doctors and also detect the patient fall in sleep which helps to monitor the body parameters of the patients in coma, which can make sure to get immediate attention when the health is not normal. IoT based application helps family members to track the coma patient's health. The SMS notification alert informs the doctor and family members immediately in case of emergency.

## **2. METHODOLOGY**

This system deals with the development of smart IOT based system for the body movement and heart beat monitoring of coma patient. The objectives of the system are:

To develop a coma patient eye blink monitoring system which can be used to monitor the eye blinks of the coma



patient using eye blink sensor.

To develop a body movement monitoring system using finger movement detection system and leg movement detection system using flex sensor implemented on the legs and finger of the coma patient.

To implement automatic notification trigger to the doctors and family members using SMS if the movement is detected.

To implement heart rate and body temperature monitoring system which will continuously monitor the heart rate and the body temperature of the patient and if there is so problem with the health of the patient automatically the notification will be triggered.

To implement patient fall detection system which will alert the doctors and family members if the patient falls down in sleep?

To develop an IOT based application which can be used by doctors and family members to monitor the health of the coma patient from anywhere in the world using cloud based android application.

To implement emergency alert notification system this will send SMS alerts to the doctors and family members if emergency condition is detected.

## **2.1 Functional Requirements**

### **1) Coma patient Movement detection system:**

Coma patient movement detection system is developed which will be used to detect the movement of the coma patient using the eyeblink sensors interfaced to the controller to detect the eyeblink, finger movement detection using smart gloves and leg movement detection. Different sensors are interfaced to the controller to detect the motion of the coma patient.

### **2) Body parameter monitoring system:**

Body monitoring system is developed which will be used to monitor the body parameters such as heart rate and the body temperature using pulse rate sensor and the body temperature sensor interfaced to the body of the coma patient.

### **3) Fall detection System:**

Fall detection system is developed which consists of detection of the person fall in sleep and if the fall is detected the system will automatically trigger an alert. This phase involves interfacing of the MEMS sensor to detect if the person falls.

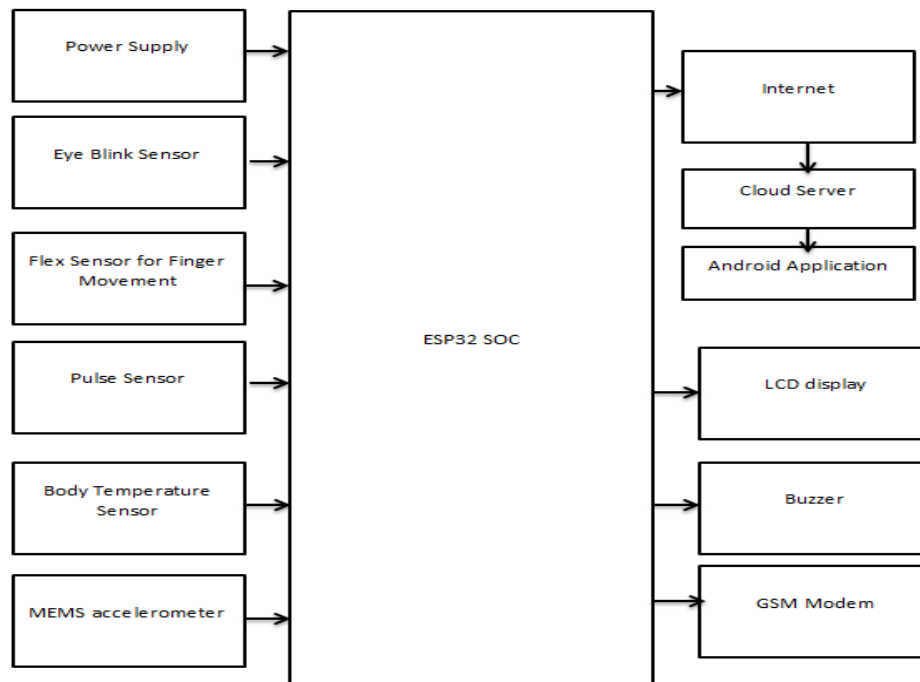
### **4) Emergency SMS notification system:**

SMS based emergency notification system is developed. If the person is in emergency health condition it will immediately trigger an SMS notification alert to the patients doctor and the family members. IOT Based Patient backend system development on the cloud IOT based backend which will be hosted on the cloud server.

## **3. DESIGN AND IMPLEMENTATION**

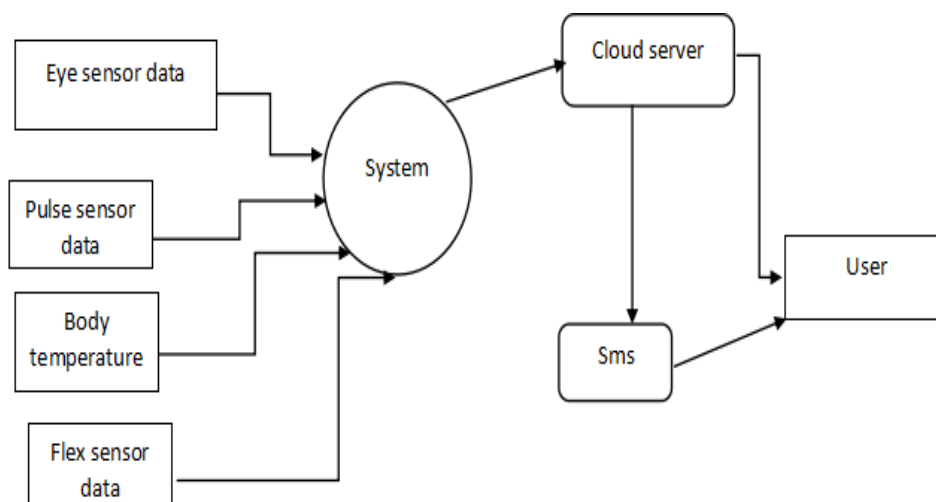
The project deals with an efficient solution for coma patient movement and health monitoring using IOT. The project uses ESP32 controller board which will be interfaced with multiple sensors which can monitor the movement state of the coma patients. The Coma patients are continuously monitored for eye movement using eye blink sensor, finger movement and leg movement. Whenever the movement is detected, the immediate notification will be triggered to the doctor so that the doctor can come and attend immediately. The proposed project also

implements fall detection of the coma patients. The Accelerometer is interfaced to the ESP32 board which checks for the fall of the patient and if the patient falls in sleep the alert will be triggered. The system monitors the health parameters of the patient and displays it on the LCD screen. The android application is also developed which will help the family members to track the patients health form home itself.



**Fig. 1 Block Diagram of Body Movement and Heart Beat Monitoring of Coma Patients Using IoT**

**DATA FLOW DIAGRAM:**



**Fig 2: Data flow Diagram**

This section gives details of the different components, modules and sub components involved in the system.

**Monitoring system**

**Eye blink detection**

This sensor is used to detect eye blinking of coma patient. This sensor detects the eye blink and sends data to



controller and then it will send to the doctor.

#### **Leg movement detection**

For leg movement detection we have used flex sensor. It will give the data regarding leg movement of coma patient that will be helpful for the doctor to take further actions.

#### **Heart rate detection**

Heart rate is the important factor to detect in coma patient. This plays very important role in treating the patient. This data is collect using heart rate sensor and send notification to the doctor immediately.

#### **Cloud Server**

This is used to send data from hardware to android application over internet.

#### **Android Application**

##### **Display all sensor data**

Android application is designed for doctors and family members to send the data of coma patient. All the sensor data will be sent to the android application over internet. Eye blink data, leg movement data, heart rate data, sleep fall detection data.

##### **Send notification**

The notification will be sent to the doctor and family member regarding detection on any movement of c coma patient. This will be sent over internet to android application.

#### **PSEUDOCODE:**

Start

Initialization

Activate all sensor

Activate wifi

Connect to internet

If eye blink DETECTED

    Display data on android application

    Send notification

ELSE If leg movement DETECTED

    Display data on android application

    Send notification

ELSE If leg movement DETECTED

    Display data on android application

    Send notification

ELSE If Heart rate

    Display data on android application

    Send notification

Else

Keep monitoring data until changes happen



**Algorithm:**

Coma patient monitoring system

I/P: Sensor value

O/P: send notification to doctor/ family members

Step1: activate system

Step2: activate Wifi

Step3: connect to internet

Step4: start reading data from all sensors

Step5: send data to cloud server

Step6: monitor the data

if any fluctuation in data found

Send Notification to doctor and family members

**Android application:**

I/P: data from cloud server

O/P: Display data and notification

Step1: start Android application

Step2: start internet

Step 3: get data from server and display

Step4: display Notification when send data get fluctuated

**4. RESULTS**

The human interface is in the form of android application where all the data of coma patient is displayed. It will be used to view data and get notification when any movement occurs. The screen shot of the software part is shown in Figure 2.





Fig.3 IOT app UI

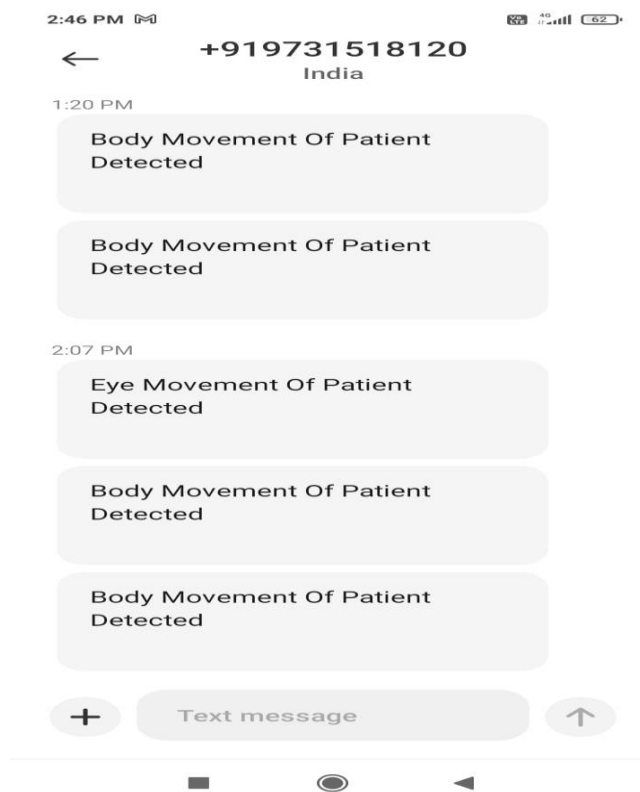


Fig.4 IOT app UI

## 5. Conclusion

This system is used for monitoring the health related parameters of coma patients such as movements, pulse rate, temperature, hand, and leg movements. Such healthcare systems are needed to continuously monitor and record all the vital information of a particular subject by maintaining all the records of that comatose manually. The system monitors the health parameters of the patient and displays it on the LCD screen. The android application is also developed which will help the family members to track the patients health from home itself.

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